REMARKS

Claims 1-13, 15-17, and 19-30 are pending in the application. Claims 1 and 16 have been amended, and claims 14 and 18 have been previously cancelled. New claims 28-30 have been added to the application. No new matter has been introduced by the amendment.

Rejection Under 37 CFR 103(a)

Claims 1-13, 15-17, and 19-27 have been rejected over Kellar et al. et al. in view of Suga. This rejection is overcome in view of the amendment of claims 1 and 16, together with the following remarks.

Claim 1, as amended, recites a method in which active components and critical passive components are fabricated. In one aspect, the active components and passive components are characterized by the temperature at which each are fabricated. According to claim 1, the production temperature of the critical passive components is in excess of the temperature at which the active components are unacceptably degraded. (See, for example, Substitute Specification, pg. 6, ll. 21-31). Claim 1 further recites that an interconnection line is formed after bonding the first and second substrate. (See Substitute Specification, pg. 13, ll. 14-21).

The applicants assert that claim 1 now defines a key distinction between active components and critical passive components. As set forth in the applicants' specification:

> "According to the invention, a second material may in particular be produced on a silicon substrate at a temperature higher than the maximum temperature to which the silicon substrate may be heated because of a first material already present on the wafer. The invention enables this by producing the second material separately from the silicon wafer on which it is to end up and then integrating the second material onto that wafer by layer transfer techniques." (Substitute Specification, pg. 6. ll. 21-27).

The difference in the temperature tolerance between the critical passive components and the active components imparts a substantial difference between the

first and second substrates that are subsequently bonded. By producing components having different temperature tolerances on different substrates, the associated fabrication parameters of the two substrates are decoupled, which enables wider processing latitude of the individual components on the substrates. For example, as set forth in the applicants' specification, "in the particular case of decoupling capacitors ... the dielectric material of the capacitor [can be] heated to temperatures enabling crystallization of the perovskite phase without any restriction being imposed on by the underlying interconnection metal and without having recourse to a thermal protection barrier between the two substrates." (Substitute Specification, pg. 6, ll. 27-31). Accordingly, small and efficient passive components can be fabricated without damaging the temperature-sensitive components in the integrated circuit.

The applicants assert that neither Kellar et al. nor Suge suggest or disclose producing two substrates, having components of differing temperature tolerance, that are subsequently bonded together. Kellar et al. disclose wafers (110, 120 and 130) that include microprocessors, memory devices and RF communication devices, and wafers (210 and 220) that both include active devices. Kellar et al. do not make any distinction between the temperature tolerance of the devices, nor any distinction between the components that populate the substrates. The Examiner acknowledges the failure of Kellar et al. to disclose a second substrate that includes critical passive components. (Office Action, pg. 3). The applicants further assert that Kellar et al. fail to disclose critical passive components within the meaning of claim 1. Namely, Kellar et al. do not suggest or disclose a structure in which critical passive components are fabricated above a temperature at which unacceptable degradation of the active components will occur.

Claim 1 also recites that an interconnect line is produced passing through the second substrate after bonding the first and second substrates. The second substrate includes critical passive components defined as noted above. The applicants assert that Kellar et al. fail to disclose producing an interconnection line passing through the second substrate. This is at least because Kellar et al. do not disclose forming an interconnection line though a substrate including critical passive components.

The applicants assert that Suga fails to make any distinction between substrates with critical passive components and active components and the associated processing restrictions. Suga are merely concerned with improvement of electrical connections within a die. (See Col. 1, ll. 46-47). Indeed, Suga disclose fabrication of transistors, capacitors, and other devices on both the first portion (100) and the second portion (200). (See Col. 4, ll. 57 to Col. 5, ll. 12). Accordingly, Suga does not suggest or disclose producing two substrates where one substrate includes critical passive components and the other does not.

The applicants assert that the cited combination of references does not suggest or disclose their claimed invention at least because neither reference discloses formation of components having disparate thermal tolerance on different substrates. According to amended claim 1, all of the critical passive components are included within the second substrate. Further, the critical passive components are produced at a temperature above which the active components are unacceptably degraded. The addition of Suga does not overcome the deficiency of Kellar et al., at least because neither of these references suggest or disclose separate treatment of such critical passive components. The applicants further assert that neither Kellar et al. nor Suga suggest or disclose formation of an interconnection line that passes through the substrate that contains the critical passive components. Accordingly, Suga fails to fill the gap in the teaching of Kellar et al.

Claims 2-13 and 15 depend directly or indirectly from claim 1. These claims are allowable in view of the amendment and foregoing remarks pertaining to claim 1.

Claim 16 recites a die containing an integrated circuit comprising active components and passive components. Claim 16 has been amended to specify that the active components and passive components are characterized by the temperature at which each are fabricated. Further, the production temperature of the critical passive components is in excess of the temperature at which the active components are unacceptably degraded. The applicants assert that claim 16 is allowable over the cited combination of references at least in view of the foregoing remarks pertaining to claim 1.

Claims 17 and 19-27 depend directly or indirectly from claim 16. These claims are allowable in view of the amendment and foregoing remarks pertaining to claim 16.

New Claims

Claims 28-30 are newly added in order that the applicants can more fully claim the subject matter of their invention.

Claim 28 depends from claim 1 and recites that the second temperature is about 450°C. According to the applicants' specification, temperatures about 450°C are avoided to allow integration of active and passive components. (See, pg. 3, ll. 28-32, and pg. 4. ll. 1-8).

Claim 29 depends from claim 1 and recites that producing the first substrate comprises producing a substrate including all of the active components of the integrated circuit, and wherein producing the second substrate comprises producing a substrate including only passive components. As illustrated in FIGs. 1 and 2 of the applicants' drawing and the associated specification text, the first substrate contains active components and the second substrate contains insulating trenches, capacitors with high dielectric constants, MEM devices, inductive trenches, and the like.

Claim 30 depends from claim 1 and recites that producing the first substrate further comprises producing an interconnect metal that may be degraded at the first temperature. According to the applicants' specification, aluminum and copper interconnections are degraded at the temperatures required to crystallize perovskites. (Specification, pg. 2, ll. 10-19).

The applicants assert that their new claims further define patentable aspects of their invention recited by claim 1.

Substance of Interview

In a telephone interview conducted February 26, 2010, the applicants' undersigned attorney discussed the amended claims with the Examiner. The applicants appreciate the courtesy extended by the Examiner in granting the interview.

The applicants' attorney explained that numerous elements in an active component cannot withstand the temperatures used in fabrication of critical passive components such as certain capacitor materials. It was further pointed out that the background section of the applicants' specification discusses the failure of the prior art to provide a solution in which a die is formed with an integrated circuit having interconnected critical passive and active components. (See, for example, Substitute Specification, pg. 1, ll. 22-28, pg. 3, ll. 15-32). The Examiner indicated that further consideration would be given to the amended claims in view of the cited prior art.

The applicants have made novel and non-obvious contribution to the art of integrated circuits including active and passive components and to their fabrication. The claims at issue are distinguished over the cited references and are in condition for allowance. Accordingly, such allowance is now earnestly requested.

Respectfully submitted,

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